

REMARKS

Claims 1-5 and 37-39 are currently pending in the application, as amended. Claims 1-5 have been amended to replace the term "means" with the term "unit". Claim 1 has been further amended to delete the recitation of a main relief valve and an electromagnetic relief valve and to recite as new elements a pump discharge pressure control unit, a supplying oil quantity control unit and a supplying oil quantity signal outputting unit. Support for addition of the pump discharge pressure control unit is found in the specification, for example at page 47, line 20 – page 48, line 7. Support for recitation of the supplying oil quantity control unit and the supplying oil quantity signal outputting unit is found in original claim 2. Claims 1, 2 and 4 have been amended to replace the term "current" with the term "pressure signal". Claims 1, 2 and 4 were generally amended to be consistent with U.S. patent practice. Claims 6-36, previously withdrawn due to a restriction requirement, are cancelled by this amendment. New dependent claim 37 has been added to recite subject matter deleted from amended claim 1. New independent claim 38 recites subject matter supported in the specification and in the drawings, for example at page 45, line 6 through page 61, line 20 and in Fig. 1, and in claim 1. New dependent claim 39, depending from claim 38, recites subject matter deleted from amended claim 1. No new matter has been added with this amendment.

Claim Rejections Under 35 U.S.C. §112

The Examiner has rejected claims 1-5 under 35 U.S.C. §112, first paragraph as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention; in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention; and/or because the best mode contemplated by the inventor has not been disclosed. More specifically, citing claim 1, lines 45-54 and the specification page 52, lines 5-8 and page 53, line 11 to page 54, line 3, the Examiner contends:

the above claim and discussion indicates that the pressure difference between the pressure supplied by the pump and the pressure of the working oil is a maximum of 20 kg/cm². Since the main relief valve 45 is moved to an open position by the pressure

supplied by the pump and moved toward a closed position by pressure in pilot line 67 and by the spring; to achieve this pressure difference, the pressure in the pilot line plus a pressure corresponding to the spring must be equal to the working pressure plus the 20 kg/cm². Since the pressure in the pilot line 67 is only a function of the working pressure, the current sent to the electromagnetic relief valve 46 is only a function of the working pressure, and therefore it is unclear why the supply pressure is sent to the control unit 23B, and how the supply pressure is used to generate the current for the electromagnetic relief valve 46.

The Examiner concludes:

If the supply pressure is not used to determine the current for the electromagnetic relief valve 46, as appears evident from the above discussion, then the disclosure is confusing, for indicating that the supply pressure is used to determine the current. Otherwise, if the supply pressure is used to determine the current for the electromagnetic relief valve 46, the specification is not enabling to one of ordinary skill in this art, since the relationship between the working and supply pressures and the current is not specified.

Applicants respectfully traverse this rejection in view of the foregoing amendment.

Claim 1, as amended, recites, *inter alia*, a rotation control unit including:

a pump discharge pressure control unit for controlling a pressure of the working oil supplied from the working oil supplying unit to the working oil control unit to be equal to or lower than a set pressure;

Claim 1 has been amended to recite a pump discharge pressure control unit, rather than the main relief valve and the electromagnetic relief valve. Support for replacing the elements of the electromagnetic relief valve and the main relief valve with a single element characterized as a pump discharge pressure control unit is found in the specification, particularly at page 47, line 20 through page 48, line 7:

The oil pressure control circuit 22B feeds current to the electromagnetic relief valve 46 to vary a set pressure of the electromagnetic relief valve 46 to thereby vary a set pressure of the main relief valve 45. Consequently, the oil pressure control circuit 22B executes such a control that the pressure of the working oil supplied from the hydraulic pump 42 is higher, by a predetermined pressure, than the pressure of the working oil for driving and rotating the hydraulic motor 43.

The artisan will recognize from this disclosure that the electromagnetic relief valve 46 and the main relief valve 45 thus act as a “pump discharge pressure control unit”, and that term may be substituted for the previously recited elements of the electromagnetic relief valve and the main relief valve.

Claim 1 has been further amended to replace the term “current” with “pressure signal” to more particularly point out and claim the present invention. Support for the amendment is found in the specification at page 47, line 20 through page 48, line 7, as discussed above. Claim 1 has been further amended for consistency with the above-described substitution of the pump discharge pressure control unit.

Claim 1, as amended, no longer recites “outputting a current to the electromagnetic relief valve to vary the set pressure of the electromagnetic relief valve and thus the set pressure of the main relief valve”. As these elements have been deleted from claim 1, the basis for the Examiner’s contention that “if the supply pressure is used to determine the current for the electromagnetic relief valve 46, the specification is not enabling to one of ordinary skill in this art, since the relationship between the working and supply pressures and the current is not specified” is moot.

Furthermore, one skilled in the art having Fig. 1 and the disclosure of the specification, page 45, line 6 through page 61, line 20, before him would understand that the pressure signal supplied to the pump discharge pressure control unit is related to the pressure of the supply pressure (the pressure measured at pressure gage 49 and transmitted to the controller 23B by signal 35), the pressure at the hydraulic motor 43 (measured by pressure gages 47 and 48 and transmitted to the controller 23B as electrical signals 33 and 34) and the predetermined pressure. The artisan would further understand that constants used by the controller 23B to calculate the current are a function of the physical characteristics of the system (e.g. line losses in and dynamic response characteristics of the system components). Still further, the artisan would recognize that the constants mathematically relating the current and the system pressures would be determined experimentally using the actual system hardware.

In view of the foregoing, Applicants respectfully submit that claims 1-5 are in full compliance with 35 U.S.C. §112, first paragraph and request that the rejection of claims 1-5 under section 112 first paragraph be withdrawn.

Claim Rejections Under 35 U.S.C. §103

The Examiner has rejected claims 1 and 3 under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 3,621,762 (Ikebe *et al.*, hereinafter "Ikebe") in view of U.S. Patent No. 4,468,173 (Dantlgraber). The Examiner states that Ikebe discloses all of the elements of claim 1 of the present invention with the exception of disclosing the following:

- a main relief valve for regulating a pressure of the working oil supplied from the supplying means to be equal to or lower than a set pressure,
- an electromagnetic relief valve for varying the set pressure of the main relief valve, and
- oil pressure control means for receiving the drive oil pressure signal from the drive oil pressure detecting means and outputting a current to the electromagnetic relief valve to vary the set pressure of the main relief valve, thereby controlling the pressure of the oil supplied by the supplying means to be higher, by a predetermined pressure, than the pressure of the working oil of the rotary member.

The Examiner, in particular, contends that numerical control unit 401 corresponds to the operation position inputting means of the present invention. The Examiner further contends that the pulse train converter 402 corresponds to the operation position signal outputting means of the present invention, and that the pressure sensor (either pressure detector 116 or 117) corresponds to the supplying oil pressure detect means of the present invention.

Further, the Examiner contends that Dantlgraber teaches a supplying means supplying pressurized working oil to a hydraulic motor. Still further, the Examiner contends that the supplying means of Dantlgraber includes:

- a variable displacement pump,
- a main relief valve (130) for regulating a pressure of the working oil supplied from the pump to be equal or lower than a set pressure,

an electromagnetic relief valve (20) for varying the set pressure of the main relief valve and

an oil pressure control means for outputting a current to the electromagnetic relief valve to vary the set pressure of the main relief valve, thereby controlling the pressure of the oil supplied by the pump, for the purpose of conserving energy needed to drive the pump.

The Examiner takes Official Notice that:

a variable displacement pump delivering pressurized oil to a hydraulic motor at a pressure regulated to be equal or lower than a set pressure, that the set pressure is a predetermined pressure above a load pressure of the motor, for the purpose of having sufficient pressure to drive the motor without wasting energy.

The Examiner opines that it would be obvious to an artisan to include the aforementioned features of Dantlgraber in a modified Ikebe device,

thereby controlling the pressure of the oil supplied by the pump as part of the supplying means of Ikebe, as taught by Dantlgraber, for the purpose of conserving energy needed to drive the pump; with the set pressure being a predetermined pressure above a load pressure of the motor, for the purpose of having sufficient pressure to drive the motor without wasting energy.

Applicants respectfully traverse this rejection in view of the foregoing amendment.

Claim 1, as amended, recites in pertinent part,

a supplying oil quantity control unit for controlling a quantity of the working oil that the working oil supplying unit supplies; and

a supplying oil quantity signal outputting unit for receiving the operation position signal output from the operation position signal outputting unit, generating a supplying oil quantity signal from the operation position signal, and outputting the supplying oil quantity signal to the supplying oil quantity control unit, thereby controlling the quantity of the working oil supplied to the supplying oil quantity control unit by the working oil supplying unit.

The elements of a supplying oil quantity control unit and a supplying oil quantity signal outputting unit are substantially the same as the corresponding elements previously recited in

original claim 2, the only difference being the replacement of the word "means" with the word "unit".

Ikebe does not disclose each and every element of the present invention. Ikebe discloses a control system for an electrohydraulic motor wherein the gain of the motor is adjusted in accordance with the torque load imposed upon the motor, so as to maintain a constant total system gain. Ikebe specifically discloses a pressurized oil source 112, which supplies oil to a hydraulic motor 111, via a spool 102 enclosed within a sleeve 106, the combination of the spool 102 and the sleeve 106 serving as a rotary pilot valve. The position of the spool 102 within the sleeve 106 is controlled by a electric pulse motor 101. Rotation of the electric pulse motor 101 is controlled by a pulse motor drive circuit 407, which receives input commands from a pulse train converter 402. The pulse train converter 402 receives an input signal from a numerical control unit 401. In steady state operation, the output signal F of the numerical control unit 401 equals the output signal f of the pulse train converter 402. Consequently, Ikebe teaches a control system for an electrohydraulic motor that modifies the gain factor K1 of the pulse train converter 402 during transient operation such that the total gain K of the control system is held constant.

Ikebe fails to disclose each and every element of Applicants' invention. More specifically, Ikebe fails to disclose at least the elements of the supplying oil quantity control unit and the supplying oil quantity signal outputting unit. Accordingly, there is no objective teaching in Ikebe that would enable one of ordinary skill in the art to modify the invention of Ikebe in a manner that would render the present invention obvious under 35 U.S.C. § 103(a).

Dantlgraber does not disclose each and every element of the present invention. Dantlgraber discloses a system capable of controlling a variable displacement pump used to supply oil to hydraulic devices. The system is capable of controlling the pump over separate high and low pressure ranges. More particularly, Dantlgraber discloses a variable displacement pump 1, a first pressure control valve 8, a second pressure control valve 30, a pressure transducing valve 25 and a pressure relief valve 20. The two pressure control valves 8 and 30 operate to control the output pressure of the pump 1, with the control valve 30 effecting control

in a lower pressure range and the control valve 8 effecting control in a higher pressure range. The relief valve 20 operates to select which control valve is operational.

Dantlgraber also fails to disclose at least the elements of the supplying oil quantity control unit and the supplying oil quantity signal outputting unit. Accordingly, there is no objective teaching in Dantlgraber that would enable one of ordinary skill in the art to modify the invention of Dantlgraber in a manner that would render the present invention obvious under 35 U.S.C. § 103(a).

There is no objective teaching in Ikebe or Dantlgraber, nor is there knowledge generally available to one of ordinary skill in the art, that would lead the artisan to combine the electrohydraulic control system of Ikebe with the mechanical hydraulic pump pressure control system of Dantlgraber. Accordingly, the Ikebe and Dantlgraber references are not properly combinable under 35 U.S.C. § 103(a) to render the present invention obvious.

Even if Ikebe and Dantlgraber were combined, the combination does not render the present invention obvious. More specifically, the combination of Ikebe and Dantlgraber fails to disclose at least a supplying oil quantity control unit and a supplying oil quantity signal outputting unit. As Ikebe combined with Dantlgraber fails to teach or suggest all of the elements of claim 1 of the Applicants' invention, it is respectfully submitted that a *prima facie* case for obviousness has not been established with respect to claim 1 and also with respect to claim 3 which depends directly from claim 1. Accordingly, it is requested that the rejection of claims 1 and 3 under 35 U.S.C. § 103(a) be withdrawn.

New claims 37-39

Applicants have added new dependent claim 37, depending from claim 1, new independent claim 38, and new dependent claim 39, depending from claim 38. New dependent claim 37 has been added to recite subject matter deleted from amended claim 1. New independent claim 38 recites subject matter supported in the specification and in the drawings, for example at page 45, line 6 through page 61, line 20, in claim 1 and in Fig. 1. New independent claim 38 is patentably distinct from the references of Ikebe and Dantlgraber at least for the recitation in claim 38 of the supplying oil quantity control unit (51) and the supplying oil

quantity signal outputting unit (23C), discussed above relative to claim 1. New dependent claim 39 also recites subject matter deleted from amended claim 1.

Applicants submit that the cited references, individually or in the combinations proposed by the Examiner, fail to teach, suggest or disclose a hydraulic drive apparatus as described by claims 37-39. Accordingly, Applicants respectfully request allowance of new claims 37-39.

CONCLUSION

In view of the foregoing amendment and remarks, Applicants respectfully submit that the present application, including claims 1-5 and 37-39, is in condition for allowance, and such action is respectfully requested.

Respectfully submitted,

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